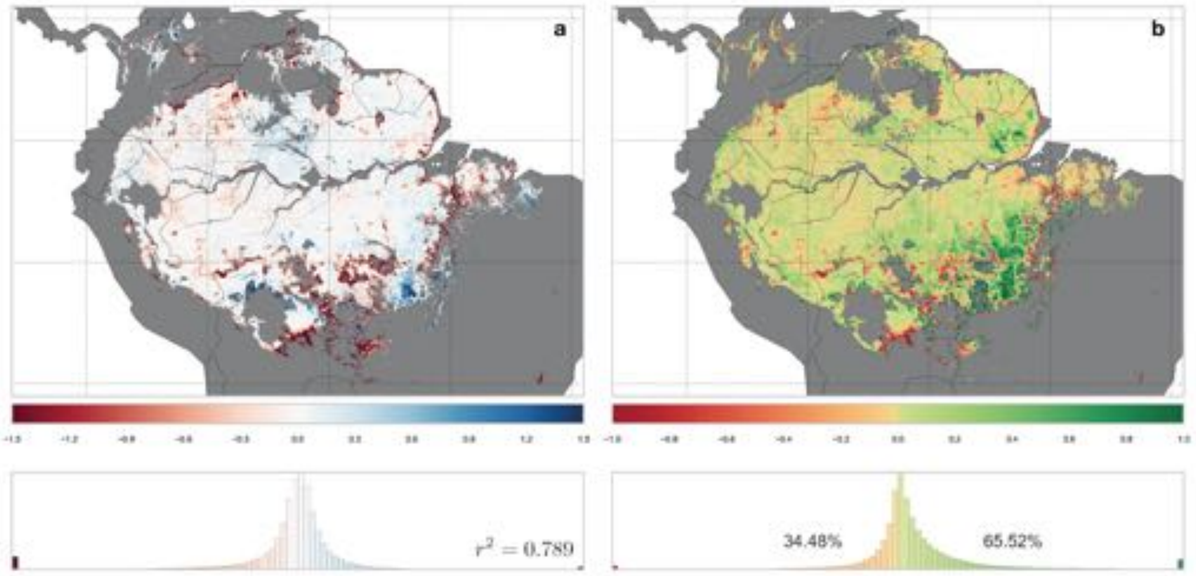
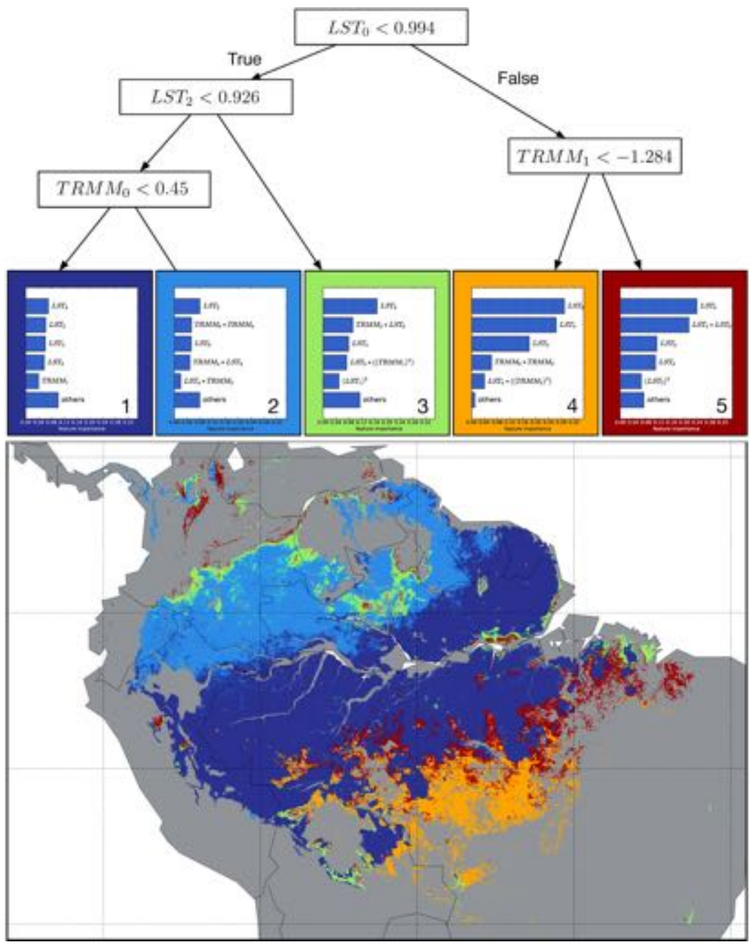


This image shows (a) spatial patterns of prediction errors of our Amazon region GP-tree model, averaged over the years 2003–2010. Positive and negative values indicate underestimated and overestimated vegetation predictions, respectively. The model captures almost 80% variation in the data, a 10% improvement over a linear model. (b) Differences in prediction errors between linear and nonlinear models. Green color indicates locations where the model provides more accurate predictions. *Kamalika Das, NASA/Ames; Marcin Szubert, University of Vermont*



Hierarchical model with five partitions illustrated as a decision tree, with leaves color-coded to match the geographic area corresponding to each partition of the Amazon region on the map. For each leaf, we show the five most important model features, sorted according to their contributions toward explaining the vegetation variance within those partitions. LST and TRMM indicate land surface temperature and precipitation, respectively, with the numerical indices referring to the season index. *Kamalika Das, NASA/Ames; Marcin Szubert, University of Vermont*

National Aeronautics and Space Administration

Understanding the Amazon Rainforests Using Machine Learning

Scientists are growing increasingly concerned that in a progressively warming and drying climate, the Amazon rainforests—the largest terrestrial carbon sinks—may exhibit reduced photosynthetic activity and suffer from higher rates of tree mortality, leading to further amplification of anthropogenic climate change. In order to estimate the effect of climate change on the health of the Amazon, it is essential to accurately quantify how different climatic factors affect vegetation in the region. In this work, we use machine learning, optimization, and large scale computation to obtain the governing equations of climate-vegetation dynamics in the Amazon, and to explain the various, often divergent, theories about the future of these rainforests.

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